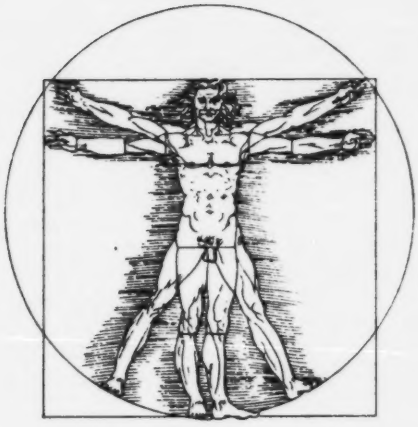

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

ANNUAL REPORT 1986-87

AHFMR
ANNUAL REPORT
1986-87

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Alberta Heritage
Foundation for
Medical Research

3125 ManuLife Place
10180 - 101 Street
Edmonton, Alberta T5J 3S4
Tel: (403) 423 5727

Letter from the Chairman

The Alberta Heritage Foundation for Medical Research has now completed seven full years of operation.

The accomplishments of Alberta-based medical scientists are described elsewhere in this report and represent significant advances in several ways: through continued meritorious research; through recognition by their peers in gaining prizes and awards; and through increased activity leading to the probable commercialization of University-originated discoveries.

There is new solid evidence of the success achieved by Foundation-funded scientists in obtaining significant outside funding for operating grants from national granting agencies. These operating grants supplement and reinforce the Foundation's programs.

While the primary thrust of the Foundation's programs will continue to be funding medical research at the most fundamental level, it is nevertheless a source of great satisfaction to see increasing activity in technology transfer — the process which moves research findings from the laboratory bench to commercial application. There is an increased awareness and appreciation of how universities benefit as the result of these activities.

Total expenditures for the year ended March 31, 1987 amounted to $58.5 million compared with $45.3 million in the previous year. The current years' expenditures include $21.7 million for building programs grants compared with $5.5 million for the previous year. When these building grants are not considered in the total, 1986-87 saw a decrease of $3 million in the Foundation's regular operating expenditures. Approximately $26.6 million more will be expended to complete the Heritage Medical buildings in Calgary and Edmonton.

The Foundation continues to monitor the investment performance of its Endowment Fund established in March 31, 1980, with a capital endowment of $300 million. Despite record high expenditures in 1987, the net assets of the Endowment Fund, at March 31, 1987 exceeded the net assets at March 31, 1986 on both a cost and market value basis.

	Endowment Fund Net Assets	
	March 31, 1987	**March 31, 1986**
At cost	$449,000,000	$443,000,000
At market value	$529,000,000	$515,000,000

The investment performance of the Endowment Fund must be carefully monitored and spending rates must be formulated in conjunction with our investment managers, to ensure that the long-term integrity of our core funding programs is maintained.

I would like to thank the Trustees for their dedicated efforts on behalf of the Foundation in the past year.

A large share of the credit for the excellent relationships the Foundation has with the Alberta universities and the medical community is owed to Dr. Lionel McLeod who, with his excellent support group in the Foundation office, has provided wise and constructive leadership.

Eric A. Geddes

IN SEARCH OF HEALTH:

Looking From the Inside Out

Leonardo da Vinci's anatomical drawings express his sense of the body's exquisite beauty and his passionate pursuit of scientific knowledge. We now have unprecedented knowledge about the human body, knowledge of a depth and breadth even the visionary da Vinci did not foresee.

The human body da Vinci drew so elegantly, medical researchers now picture in magnificent molecular detail with electron microscopic photography and other technology. They have pictured the internal process of diseases, understood and mastered many of them.

> *If you wish thoroughly to know the parts of man anatomically you—or your eye—require to see it from different aspects, considering it from below and from above and from its sides, turning it about and seeking the origin of each member ... and so will have set before you the cosmography of this lessor world.*
>
> *Leonardo da Vinci*

With accumulated knowledge and expanding technology, researchers tackle the unmastered diseases by looking at problems from three or thirty-three, different aspects. The cosmos of the body is now mapped from the inside out. Physiologists, biochemists, immunologists, virologists and others follow gene activity and cell to cell interactions. The Alberta Heritage Foundation for Medical Research supports health discovery by funding scientists with many different perspectives.

During 1986-87 the Foundation and Alberta's universities recruited people to look at old problems from new points of view. For example, two cardiologists exploit echocardiography to improve by-pass surgery and monitor post heart-attack recovery. Another scientist looks at obesity from a new point of view, the role of brown fat cells. A physician introduces cancer immunotherapy to Alberta, a treatment which capitalizes on compounds naturally found in the immune system. Stroke therapy takes on a different thrust—electrical therapy applied inside the body. Tackling a production problem creatively, Edmonton chemists invent a novel way to more efficiently produce the expensive AIDS drug, AZT.

These people add their strength to well-developed, interdisciplinary research groups and help establish new ones. This report only highlights new people recruited in 1986-87. For a more complete review of the work by the hundreds of scientists the Foundation supports, see The Second Triennial Report 1983-1986.

The President's Report

In 1986/87, two laboratory research buildings emerged from excavations at The University of Alberta and The University of Calgary; the Heritage Medical Research buildings. The lack of laboratory space for new multidisciplinary medical research groups had become a serious obstacle in the pathway to a major Foundation objective. These buildings are being funded by infrastructure grants totalling $54.8 million.

When independently able scientists from differing disciplines collaborate in a group addressing major health problems, the synergy gained results in higher overall levels of research, greater productivity, and the more rapid exploration of new ideas. Well-designed, shared physical facilities promote this collaboration and encourage more effective use of high-cost technology.

Both buildings are "on time and on budget".

Meanwhile, the universities and the Foundation worked to identify new thrusts from a range of options for these major groupings, seeking to build on existing strength and exploit current recruitment opportunities. Important progress has been made. Several groups have been approved and initial recruitment completed. A reserve of space will be maintained within the building to allow for future opportunities in emerging fields.

Alberta's medical research community has achieved new levels of excellence. Increased numbers of research dollars have moved into Alberta from external agencies attesting to the competitiveness of our scientists. Recognition and honours were awarded in greater numbers to our students, fellows and scientists. Groups of scientists generated excitement amongst their colleagues by the increasing effectiveness of their collaborative research endeavours.

Patient care has benefited further from the new specialty care expertise entering the province. This has provided earlier access to new drugs and devices. It has also resulted in greater pressure on the major teaching hospitals and government agencies for new funds and reallocation of present resources. Benefits are the direct result of the growing interface between specialty patient care services and medical research thrusts.

The Foundation's Technology Transfer program yielded early results during the reporting year. A limited number of promising proposals for the commercialization of new research ideas and concepts have been funded. A small number of applications have gained a greater rate of success than was anticipated taking into account the experience of other agencies. Funds permit the development of new products to a stage where they are more likely to attract seed capital investors. Both the private sector and the university communities benefit. The forthcoming year is expected to show increased numbers of successful Alberta-based commercial ventures resulting from this program.

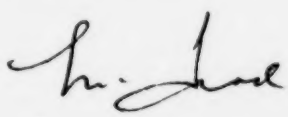
In March of 1987, the Report of the International Board of Review was received and published as a companion document to the Foundation's Second Triennial Report. The reassurance of this group of distinguished experts was of great help and important in planning the Foundation's future policies. The report verified the enormous impact the Foundation has had on the quality, quantity and significance of Alberta's medical research. The Board strongly recommended the continuation of the Foundation's programs, its goals and objectives and the mechanism by which the Foundation is funded and operated.

The report stressed a well known dilemma of modern society; how to ensure a continuing infusion of new, young, well-trained scientists into Alberta over the forthcoming years. This important issue will be addressed by the Foundation's Scientific Advisory Council, the Trustees, and most certainly, by Alberta's medical research community.

The Foundation has continued to support high quality research and has welcomed the evidence of increasing quality of applications, research reports and external assessment of Alberta's research. Scientists with records of productive, excellent research will continue to receive Foundation support. In the past two years, a small number of scientists have been denied renewal of Foundation support and while this has resulted in unease, it has indicated clearly that research productivity is a requirement for continued support.

Toward the close of the 1986/87 year, the long-term plan for the growth of Foundation-funded research was reviewed in light of the support provided by the report of the International Board of Review. Its long standing objectives will require the expenditure of some $50 million per annum by 1992 or 1993 with the expectation of only limited growth thereafter in the absence of new initiatives. This level of expenditure will require supplementation of the Foundation's endowment and a timetable has become a critical issue for the Foundation, the morale in Alberta's medical research community, and the maintenance of the highly favourable momentum developed over the past seven years.

The success of the Foundation reflects the activities of an unusually attentive body of Trustees ably chaired by Mr. Eric Geddes whose personal interest and commitment to the Foundation is limitless, and the willingness of a very large number of scientists from Alberta, Canada, and the world to offer advice, criticism and assistance in the evaluation of applications. The Foundation is indebted to a small, but dedicated staff for their willingness to meet deadlines and for their continued enthusiasm for the progress of the Foundation.



Lionel E. McLeod, M.D.

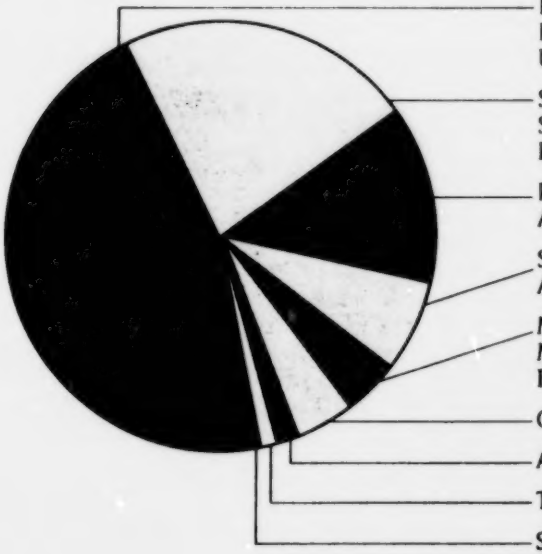
An Overview

In November 1979 an Act of Legislature created the Alberta Heritage Foundation for Medical Research to establish and support a balanced, long-term program of medical research based in Alberta. Foundation activities are directed toward the discovery of new knowledge and the application of that new knowledge to improve health care of Albertans and all people.

To build a balanced program, the Foundation supports basic and clinical scientists, both well-established people and young people beginning new research careers. Investigators explore a broad spectrum of disciplines such as: biochemistry, microbiology, pediatrics, immunology, neurology, dentistry, pharmacology and many others.

The Foundation is supported by a $300 million endowment fund and its investment earnings. The Foundation stands at arm's length from the government under the management of a group of distinguished Trustees.

AHFMR Expenditures 1986/87



	Millions $	%
Research Support Costs and Institutional Grants to Universities**	26.44	45.0
Scholarship / Heritage Medical Scientist Awards, Clinical Investigators, Establishment Grants	13.11	22.4
Fellowship Awards and Research Allowances	7.89	13.5
Studentship Awards and Research Allowances	3.83	6.6
Major Equipment Grants and Maintenance (excluding Establishment Grants)	2.50	4.3
General Research Grants*	2.58	4.4
Administrative Costs	1.11	1.9
Technology Transfer Grants	0.59	1.0
Scientific Policy and Evaluation Costs	0.47	0.8
Total	**58.52**	**100.0**

* Conference Grants, Visiting Scientists, Visiting Lecturers and Faculty Travel, Independent Establishment Grants, Independent Research Allowances, Special Initiative Funding, Visiting Professorships and Clinical Traineeships.

** Includes Institutional Grants for planning and construction of new research buildings.

Awards and Grants

The main activity of the Foundation is an awards and grants program designed to establish a critical mass of career scientists in Alberta. The program includes:

- Heritage Medical Scientist, Heritage Medical Scholarship, and Clinical Investigatorship Awards
- Studentships (full-time, part-time, and summer)
- Fellowships (full-time, part-time , and clinical)
- Establishment Grants for New Investigators
- Grants for Major Equipment
- Grants for Equipment Maintenance
- Visiting Scientists to Alberta
- Visiting Scientists from Alberta
- Visiting Lecturers
- Visiting Professors
- Travel Grants
- Grants for Conference Support & Workshops
- Technology Transfer Grants
- Clinical Traineeships

Much of the Foundation's work is carried out on the advice of a Scientific Advisory Council with 13 members who represent the national and international medical scientific communities.

The Council and its committees review and advise the Foundation on applications for loans, grants, research projects and professorships.

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William Daniel Dickie, Q.C., Calgary, Vice Chairman
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Myer Horowitz, Ed.D., President, The University of Alberta
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Healing the Heart

Sounding the Heart

A patient having an echocardiogram can watch his own heart in action. Echocardiography is a painless, accurate, and noninvasive way to observe cardiac electrical activity. High frequency sound waves produce an image of the beating heart on a video screen. Two new Heritage Medical Scholars use echocardiography to develop improved therapies for cardiac patients.

At the U of A, Dr. Bodh Jugdutt uses two-dimensional echocardiography to study changes in the structure of the heart following a heart attack and to compare the effectiveness of various treatments.

After a heart attack the damaged segment of the heart expands and interferes with pumping action. Research shows the survival rate of the patient is related to the degree of expansion. Dr. Jugdutt's studies indicate that nitroglycerin and other drugs may reduce the expansion. He also suspects some conventional therapy used to increase the force of contraction may actually exacerbate the problem.

Improving Drug Therapy

Irregular heart rhythms called arrhythmias can be life-threatening, warning of an imminent heart attack. Once accurately diagnosed with catheterization or echocardiography, physicians can prescribe a number of antiarrhythmic drugs. About one-third of the patients respond well to the drugs but the others do not.

Dr. Anne Gillis, the newest addition to the U of C's cardiology group, is investigating why this is so. She suspects the variable effects of the drugs may be influenced by their accumulation in the muscle tissue of the heart. Hopefully, studies will help physicians identify patients who are unlikely to respond to antiarrhythmic drugs so that alternative treatments can be designed.

Understanding the Cause

Dr. Dennis Vance's research is directed toward understanding the causes of atherosclerosis. He investigates lipoproteins in the liver because high concentrations of some lipoproteins are associated with an increased risk of atherosclerosis. Other lipoproteins protect against the disease because they help return cholesterol from the circulation system and other tissues to the liver for excretion.

A new Heritage Medical Scientist, Dr. Vance was recruited from The University of British Columbia to build a new group for lipid and lipoprotein research at the U of A.

Coronary Artery Disease

Atherosclerosis (hardening of the arteries) is a major cause of death in middle-aged North American males. At the U of C Dr. David McPherson uses a new echocardiographic technique to assist surgeons in coronary by-pass surgery. This surgery has helped many patients, but sometimes it is ineffective because the vein is grafted onto an area with marked atherosclerosis. Eventually, the new passageway also becomes blocked and impairs the blood supply to the heart muscle.

Dr. McPherson uses new high frequency echocardiography that pictures the artery extremely accurately so the surgeon can see exactly how much atherosclerosis there is in the arterial wall. One study indicated half of the patients with coronary artery disease had some arteries with a section of healthy wall ideal for connecting the vein graft in by-pass surgery. The new technique allows surgeons to identify such ideal sites.

INSIDE VIEW:
An electrocardiogram showing damaged cardiac tissue.

The Molecular View

U of C Heritage Medical Scholar Dr. Robert French was recruited from The University of Maryland for his expertise in the biophysics of sodium channels in brain cells. Nerves communicate with one another and with muscles by means of small electric signals. Sodium channels allow the propagation of these signals along the nerves. Therefore understanding the basic process at the molecular level has potential relevance to many diseases.

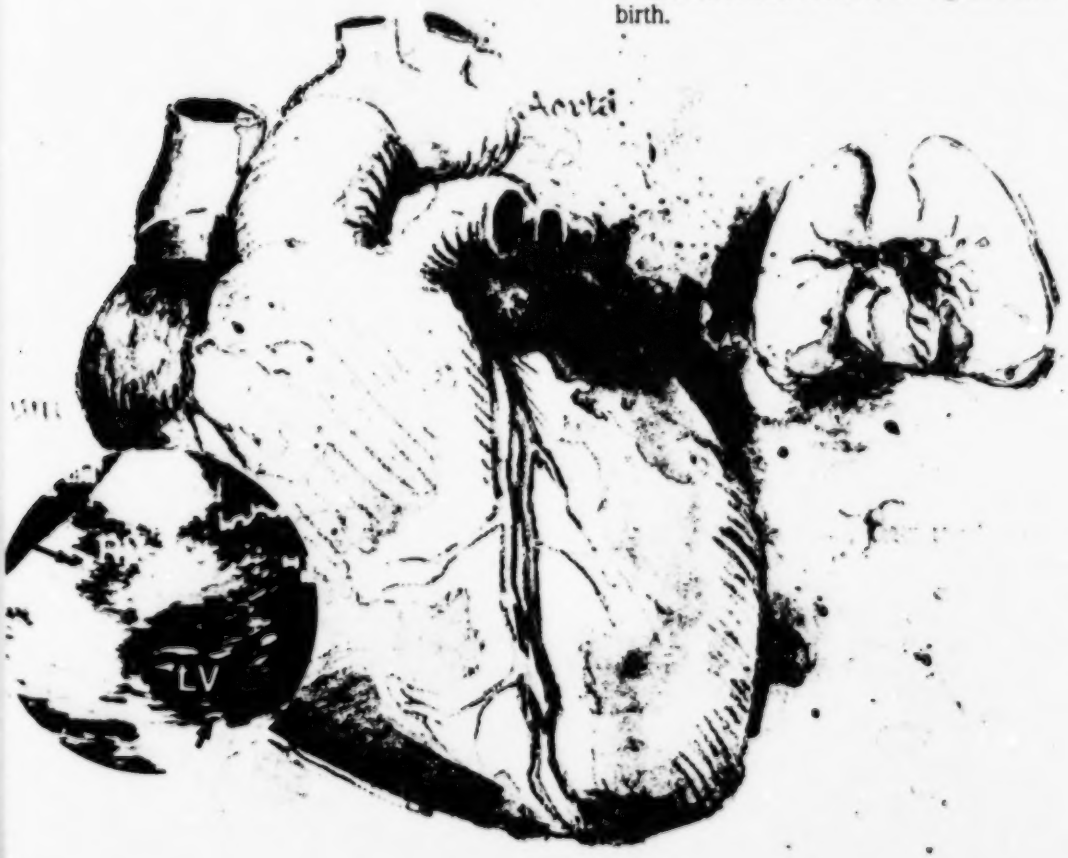
Dr. French has developed a new technique for studying the sodium channels in artificial membranes. His work complements the work of other Scholars who are investigating how drugs affect the sodium channels in nerves and the heart.

Cardiac Care for Newborns

Normally dramatic changes take place in the circulation when a newborn takes the first breath. In some babies the circulatory changes do not occur and a condition called pulmonary hypertension results. Treatment is not always effective and some of the drugs used have major side effects on the general circulatory system. A quarter of the infants with severe pulmonary hypertension die.

New Clinical Investigator Dr. Yashu Coe, formerly of the Hospital for Sick Children in Toronto, is investigating the problem. If he can understand the mechanisms of the circulatory changes, he may be able to identify a drug that will only affect pulmonary circulation and not the general circulatory system.

The Foundation also gave Dr. Peter Olley, new Chairman of the Department of Pediatrics at the U of A, an establishment grant to continue his studies of how prostaglandins control circulation before, during, and after birth.



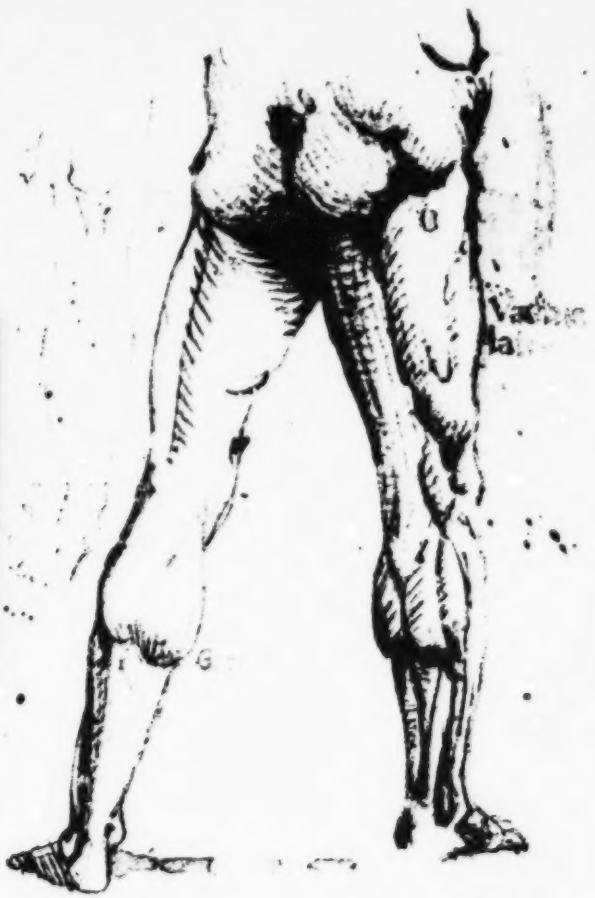
Electric Therapy

1800 years ago headache sufferers were promised relief if they placed a live electric torpedo fish on the painful spot. The fish has a special organ that shocks its prey. Over the centuries electrical stimulation for healing was sometimes used legitimately but more often for quackery with claims of miracle cures for paralysis, epilepsy, gout, and almost every other ailment. However, electrical therapy is based on a sound biological principle: nerves communicate to one another through small electric currents.

With the advent of sophisticated electrophysiological techniques, researchers are discovering that supplementing the body's natural currents can be therapeutic. The most dramatic example has almost become commonplace—the cardiac pacemaker. Now researchers are developing electric therapies to treat nerve injuries.

INSIDE VIEW:
An electrode (wire only) implanted in the body delivers a current for FES.

U of A Heritage Medical Scholar, Dr. Arthur Prochazka is developing a system that enables stroke patients to walk more normally. He was recruited from The University of London where he pioneered new recording techniques and began developing the functional electrical stimulation (FES) system. Electrodes attached to the patient's hip stimulate the hip muscles to raise and move the weak leg forward. In initial tests at The University of London, 11 out of 19 stroke patients showed definite gait improvement.



Nerve Regeneration

Another new Heritage Medical Scholar, Dr. Tessa Gordon is conducting basic research on the process of nerve regeneration. There is considerable evidence that electrical stimulation can help damaged motorneurons (neurons attached to muscles) regenerate. Dr. Gordon is investigating at the molecular level precisely how this might occur. Her research could be particularly relevant for the treatment of paraplegics who have lost control of their muscles, but still have functional motorneurons. She also conducts related animal studies on muscle degeneration in muscular dystrophy.

Prior to receiving the Foundation Scholarship, Dr. Gordon was a Medical Research Council of Canada Scholar.

Controlling Obesity

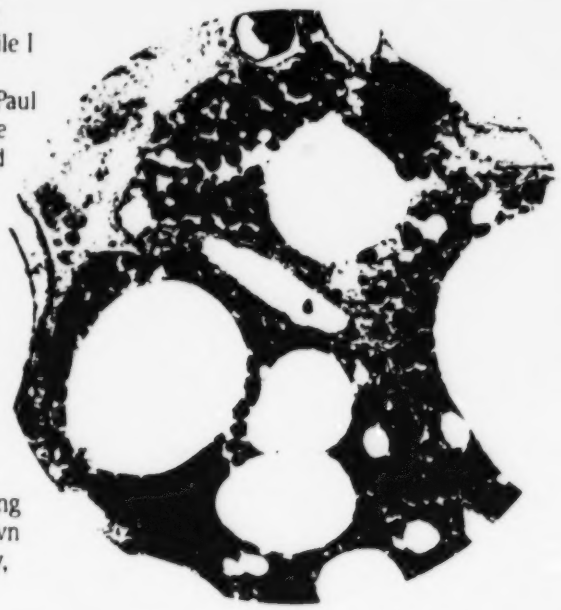
"Why" asks the frustrated dieter, "do I eat less than my friends and they stay slim while I get fat?"

U of A Heritage Medical Scholar, Dr. Paul Trayhurn is discovering that how fat we are depends not only on how much we eat and exercise, but also on how our body uses food. He is discovering brown fat may be one key to weight control. White fat cells found all over the body store energy. Brown fat cells store energy too, but they use it as fuel for producing heat. For this reason brown fat cells appear to be important in regulating the balance between food intake and energy expenditure.

How active brown fat is seems to be more important than the amount of brown fat present. Using tissue samples taken during elective surgery, Dr. Trayhurn examines brown fat activity under normal conditions, obesity, pregnancy and various disease conditions.

Dr. Trayhurn was recruited from The University of Cambridge, U.K. and while there, he collaborated with a British pharmaceutical company on developing a compound that enhances brown fat activity and reduces obesity in animals.

Dieters have long wished for a "diet pill", but Dr. Trayhurn stresses this is not the panacea for overweight people. The compound needs to be further tested. Moreover, the role of brown fat is only one of many factors in the regulation of food intake and energy balance.



INSIDE VIEW:
An electron microscopic photo of brown fat cells magnified 5000 times.

Healthier Premature Babies

Dr. Johny Van Aerde, neonatalogist at the University of Alberta Hospital, is investigating ways to improve the nutrition of premature newborns. He takes sophisticated metabolic measurements to study how premature babies use fat in formula or intravenous feedings.

Presently there is very little information on nutrition for premature babies who may metabolize nutrients very differently than full-term infants.

Originally from Belgium, Dr. Van Aerde moved to Alberta after Fellowship training at the Hospital for Sick Children in Toronto.

Relief for Diabetic Patients

A number of diabetic patients are incapacitated by severe diarrhea. Dr. Richard Fedorak has discovered clonidine, a drug used for high blood pressure, can control the problem. This is one aspect of his studies on intestinal nutrient absorption.

Dr. Fedorak is an example of a bright, highly motivated Alberta physician who was supported by a Foundation Fellowship to study abroad so he could acquire research expertise. Now a Clinical Investigator at the U of A, he plans to develop a specialty clinic for people with absorption problems in a variety of diseases.

Drs. Trayhurn, Van Aerde, and Fedorak are part of the growing research group in nutrition and metabolism at the U of A.

A Better Artificial Leg

Terry Fox and Steve Fonyo became symbols of courage as Canadians watched them walk across the country on artificial legs. What people don't realize is that for most above-knee amputees, an artificial leg can be so frustrating and require so much energy to manoeuvre that many choose crutches instead.

U of A researcher Dr. Richard Stein and technician Kelvin James have developed a new prosthesis that appears to solve some of the problems. The key to the prosthesis is an innovative knee joint controlled by electrical signals. The knee will allow an amputee to walk more normally on varying terrain and at varying speeds. Current prostheses do not have this capacity.

The Foundation has given the U of A team a Technology Transfer Grant to test the prototype on four amputees. Dr. Stein believes the new artificial leg is superior to any on the world market and that it could be manufactured in Alberta.

This is one of the 14 Technology Transfer Grants the Foundation has awarded to facilitate the transfer of new knowledge from the laboratory to the marketplace for patient care.

Improving Arthritis Therapy

Gold compounds have relieved many rheumatoid arthritis sufferers but the drugs are toxic to some people. U of A researcher, Dr. Stephen Aaron is finding that a patient's sensitivity to the gold compounds is related to the genetic composition of his or her immune system. This means Dr. Aaron may find a way to predict which drugs will be effective for any given patient.

Joint arthritis often develops when injured ligaments do not heal properly. Researchers believe ligament transplants would prevent the problem. Working under the supervision of Heritage Medical Scholar Dr. Cy Frank at the U of C, Dr. Mark Patrick has developed an animal model of ligament transplantation.

Drs. Aaron and Patrick are AHFMR Clinical Fellows, physicians who are supported by the Foundation while they gain expertise in medical research by working with established investigators.

Frequently Fellowships support scientists studying outside of Alberta with distinguished researchers in specialized fields. For example, Dr. Donna Manca is investigating the value of iodine compounds for fibrocystic breast disease at The University of Western Ontario. Dr. Edward Tredget, an Alberta plastic surgeon, is a Fellow at Harvard University where he is investigating the nature of rapid muscle wasting and protein-depletion in major burn injuries.

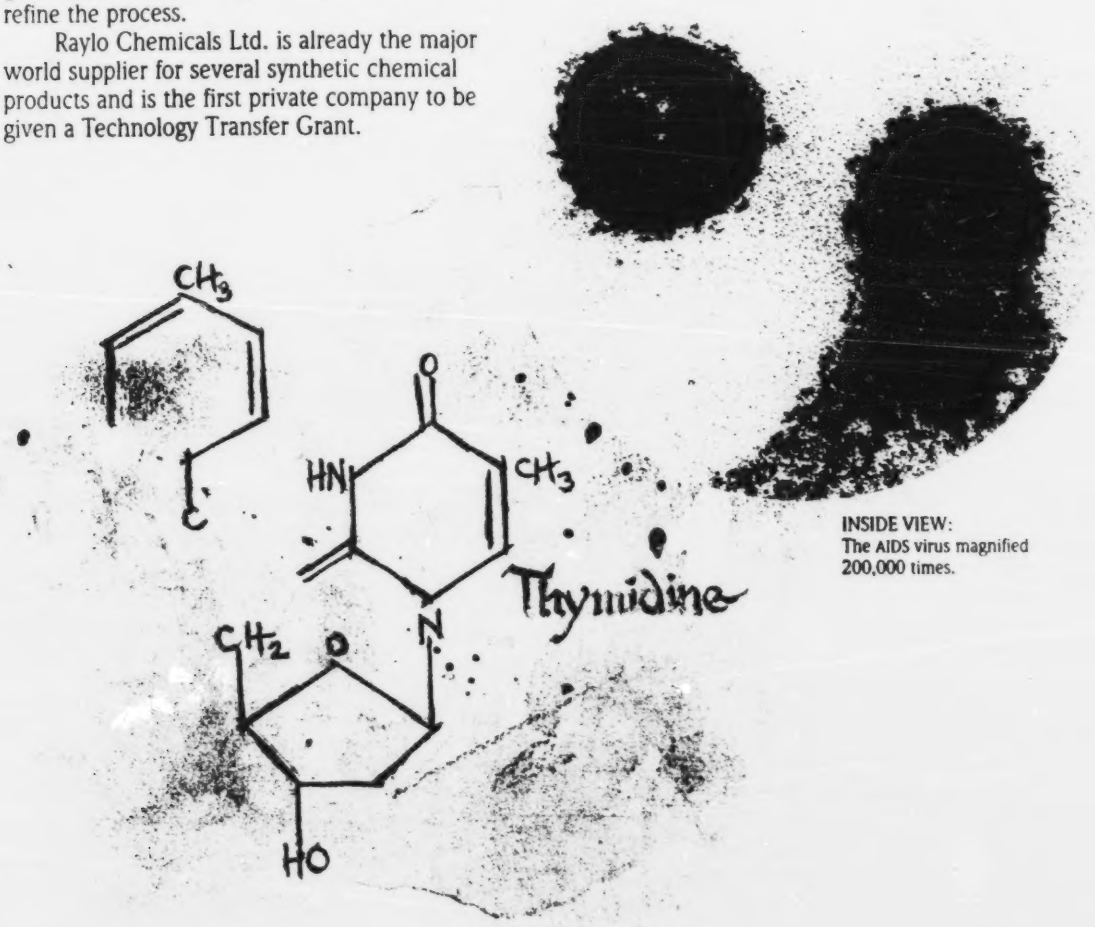
After completing a Clinical Fellowship, physicians may apply for a Clinical Investigatorship. The program is very important to the development of medical research in Alberta because it supports physicians who can bridge the gap between basic scientific knowledge and clinical research applied to patient care.

AIDS Drug Offers Hope

AZT (Azidothymidine) is a costly, potent chemical that has been shown to keep alive AIDS patients who would otherwise die. Initial clinical trials showed the death rate for people receiving placebos was about 16 times higher than the rate for patients receiving AZT. The American government has approved the sale of the chemical under the trade name Retrovir.

The problem is that the drug is extraordinarily expensive—a patient could require $10,000 worth during a year. Researchers at Raylo Chemicals Ltd. in Edmonton are developing a process that could make AZT significantly cheaper. Drs. Wolfgang Muhs and Sing Ping have found a way to produce one of the base materials, thymidine, on a large scale at reasonable cost. The Foundation has given them a Technology Transfer Grant to refine the process.

Raylo Chemicals Ltd. is already the major world supplier for several synthetic chemical products and is the first private company to be given a Technology Transfer Grant.



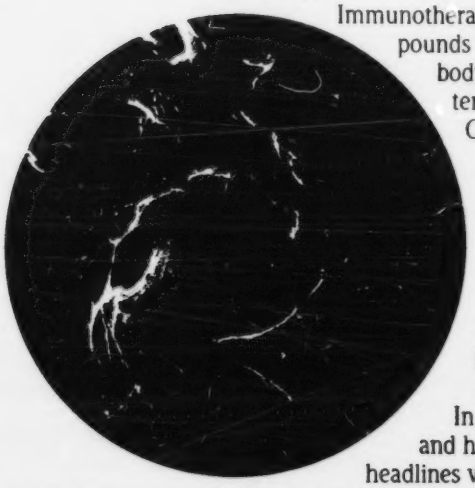
INSIDE VIEW:
The AIDS virus magnified 200,000 times.

The Cancer Front

New Cancer Treatment on Horizon

There are three traditional cancer treatments: chemotherapy, radiation, and surgery. Researchers are discovering a fourth kind of treatment called immunotherapy and some initial studies have had dramatic success.

Dr. Rene Lafreniere has been at the forefront of the breakthroughs as a former member of Dr. Steven Rosenberg's team at the U.S. National Cancer Institute. Now a new Heritage Medical Scholar at the U of C, Dr. Lafreniere is introducing the innovative research to Canada.



INSIDE VIEW:
A giant tumor cell in culture stained with flourescent antibodies.

Immunotherapy makes use of compounds produced by the body's own immune system to fight disease. Compounds such as interleukin and interferon are produced by helper cells in the immune system to activate the killer cells which attack foreign material such as tumor cells. In 1986 Dr. Rosenberg and his team made news headlines with a treatment that dramatically shrunk some types of tumors. A patient's own killer cells were harvested and treated with Interleukin-2, then reintroduced into the patient. Some months later Drs. Rosenberg, Lafreniere and colleague Paul Speiss announced another treatment that is less toxic than the first and more effective in animals. The new therapy uses natural, but outnumbered, killer cells found in tumors. The tumor-infiltrating cells are treated with Interleukin-2, then given to the animal which has been previously dosed with a chemical called cyclophosphamide.

Though the therapies look most promising, they are far from ideal. They have some severe side effects, are limited to certain types of cancer, and would be prohibitively expensive for widespread use. Dr. Lafreniere is attacking these problems at the U of C and testing variations of the procedures.

One clinical study uses a vaccine approach along with Interleukin-2 and the compound cyclophosphamide. Scientists have created a vaccine for animal tumors, but not for human tumors. Certain animal tumors are immunogenic which means the animal can recognize it and when the animal is given a vaccine made from its own tumor, it develops an immunity against the tumor. Lafreniere is investigating the vaccine potential of certain unidentified lymphocytes (cells in the immune system) that are present during tumor regression.

Though immunotherapy for cancer has been acknowledged by scientists as a possible breakthrough, all studies are still in the early experimental stages and it will be years before such treatments could be incorporated into general patient care.

Understanding Tumors

Dr. Rufus Day III is a new Heritage Medical Scholar working with Heritage Medical Scientist Dr. Malcolm Paterson on the genetics of cancer at the Cross Cancer Institute in Edmonton. Dr. Day has found that when tumor cell cultures are damaged with certain anti-cancer drugs, 20% of the cultures cannot repair their damaged genes and they die. The majority of tumor cells repair their genes and survive, as do normal cells. Dr. Day is looking for a way to identify repair-deficient tumors. Such information would aid physicians in making treatment decisions. He is also trying to purify the gene that makes the protein responsible for repairing damaged genes.

Window in the Body

X-rays and CT scans have become indispensable windows into the body. The newest technique called magnetic resonance (MR) gives physicians an even clearer window because it can reveal not only what the body looks like, but also what is happening to it biochemically. MR images can sometimes detect tumors undetectable by conventional CT scans. As well, MR can give information on how a tumor is responding to therapy in a process called spectroscopy. No radiation is involved. MR uses powerful static magnetic fields and radio frequency magnetic fields that cause nuclei in the body to align themselves in a certain way. The process is painless and presents no known dangers.

In 1983 the Foundation initiated a two million dollar medical research program at the U of A headed by Heritage Medical Scholar Dr. Peter Allen. At that time a small magnet for animal research was purchased to pursue studies mainly focusing on cancer and strokes. This equipment is now being used seven days a week by a large group of researchers in many disciplines.

In June of 1986 the U of A team initiated studies with a new $2 million whole-body magnet for clinical research. In addition to researching MR imaging, the team is developing spectroscopic studies of cancer and other problems. For example MR technology is used to answer the question: Can higher doses of radiation therapy kill tumors more effectively without causing excessive damage to normal tissue?

INSIDE VIEW:
An NM image of the head and neck.

Tracking the Source of Cancer

Cancer-causing genes called oncogenes were first discovered in cancer-causing viruses in chickens. Since then about 30 oncogenes have been identified and are thought to play a key role in cell growth. Many scientists suspect the majority of tumor cancers are initiated by events that alter the function of oncogenes or turn a proto-oncogene into an oncogene. However, very little is known about how this occurs.

Dr. Don Fujita, formerly of The University of Western Ontario, has joined the U of C to continue his work on oncogenes. He specifically studies the human s-src proto-oncogene. He joins five other Heritage Medical Scholars and Heritage Medical Scientist Dr. Jerry Wang in the Cell Regulation Group.

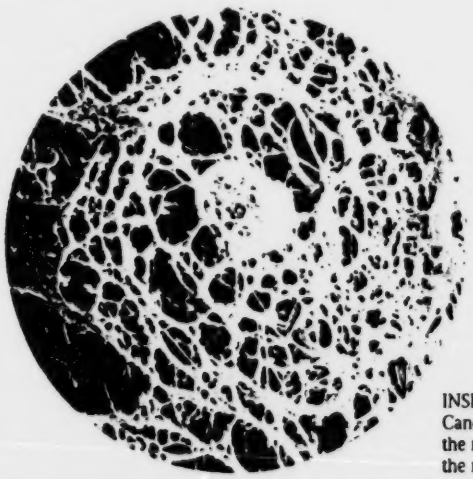
Another U of C researcher, Dr. Eva Turley, received an Establishment Grant to investigate how healthy cells are transformed into malignant ones. She has evidence that a molecule called hyaluronate makes cells more susceptible to transformations by viruses and that this molecule binds very tightly to the SARC oncogene group.

Understanding Killer Cells

At the U of A, Dr. Chris Bleackley's studies of killer cell action are preparing the way for the development of new immunotherapies. Our immune system comes equipped with a variety of killer cells that destroy target cells such as tumor cells. Dr. Bleackley is investigating precisely how cytotoxic cells kill their targets in a series of steps. He has identified two proteins that are involved at the point of contact between killer and target cells.

He explains, "The proteins are like a letter bomb packaged inside the killer cell. They don't affect the killer cell so that it destroys itself, but when fused to the target, the killer cell package is somehow opened and the target cell then explodes."

If Dr. Bleackley could block the action of the proteins he could develop a new potent immunosuppressive drug useful in transplantation. If he could explore the defective expression of genes for these proteins a compound might be developed to enhance the immune system of cancer patients.



INSIDE VIEW:
Cancer cell treated to reveal the network surrounding the nucleus.

As Far as the Eye Can See

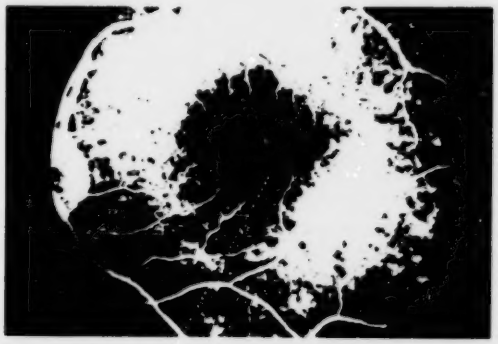
In a standard medical check-up the physician always asks the patient to follow the beam of light with his eyes. The test is important because eye movement is disturbed by many conditions such as multiple sclerosis or a brain tumor.

Ophthalmologist Dr. Bill Fletcher uses a new technology called a magnetic field coil system to test eye movement in patients at The Foothills Hospital. The technique gives very precise, sophisticated measurements of eye movement which can be crucial in helping surgeons locate tumors. Dr. Fletcher also uses the system to investigate vision in stroke patients. His studies are designed to detect visual problems not usually detected and to gather basic information about control of eye movement.

After Dr. Fletcher completed his speciality training at the U of C, the Foundation gave him a Clinical Fellowship to study with three leading North American neuro-ophthalmologists. He is now a Heritage Clinical Investigator who divides his time between patient care and research.

Retinal Disease

In 1986 Heritage Medical Scholar Dr. Paul Schnetkamp, formerly of UCLA joined six other Scholars working in the Lions' Sight Centre at the U of C. He is investigating the molecular basis of visual transduction in segments of rod photoreceptors. This is potentially relevant to a number of retinal diseases such as retinal dystrophy.



INSIDE VIEW:
An interior photograph of the eye indicates retinal disease.

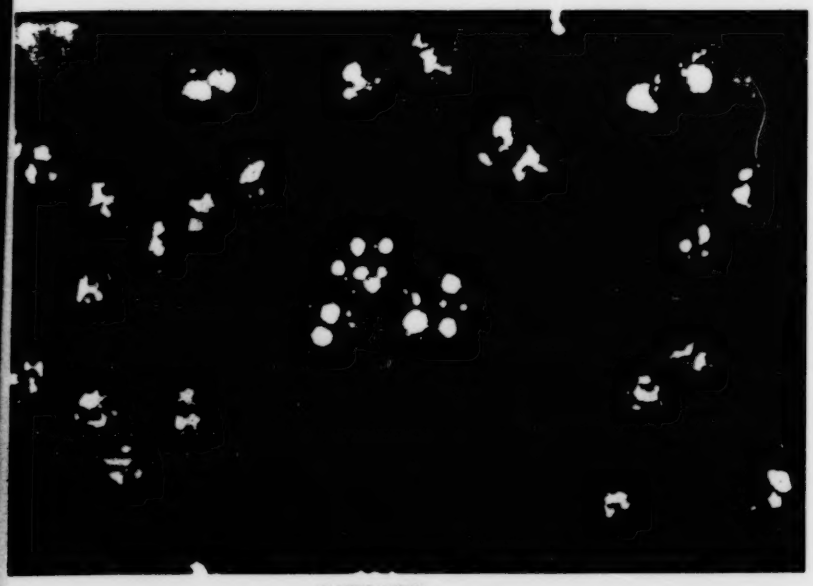
Newsfront

A Swedish nursing study shows elderly hospitalized patients are dramatically more active physically, emotionally, and intellectually when they can participate in their own treatment.

(SECOND ANNUAL NURSING CONFERENCE IN EDMONTON, MAY, 1986 ATTENDED BY 800 NURSES FROM 38 COUNTRIES.)

If she carries autoantibodies for lupus, an apparently healthy mother can bear a baby with the devastating disease called lupus. Researchers are finding whether the baby gets lupus or not depends upon the genetic background of mother and baby.

(FIRST INTERNATIONAL LUPUS CONFERENCE IN CALGARY, JUNE, 1986)



INSIDE VIEW:
Antibodies from lupus patients are stained to reveal the nuclei.

A Montreal researcher demonstrates the optic nerve can be regrown into the brain of animals. This challenges the dogma that says central nervous system neurons are not capable of regeneration.

(INTERNATIONAL CONFERENCE ON PERIPHERAL NERVE REGENERATION, AT THE U OF A, JULY, 1986)

New assays accurately predict whether or not a tumor will respond to particular drugs or radiation treatments.

(TUMOR THERAPY CONFERENCE IN BANFF, MARCH, 1987)

Beaver Fever is caused by several strains of *Giardia* and some strains vary significantly in their response to water treatment or to drugs prescribed for beaver fever patients.

(BEAVER FEVER CONFERENCE IN CALGARY, MARCH, 1987)

These were five of the 28 conferences and workshops the Foundation supported during 1986-87 to encourage the exchange of information in the international scientific community.

Statistics

TABLE 1: New Grants and Awards Implemented For the 1986-87 Award Year

Number and Value of Grants and Awards*

Award Category	U of A		U of C		Others		Total	
Studentship								
— Full-Time	$ 418,600	(28)	$ 418,600	(28)	$ —		$ 837,200	(56)
— Part-Time	3,000	(1)	3,000	(1)	—		6,000	(2)
— Summer	348,477	(93)	262,089	(67)	11,217	(3)	621,783	(163)
Fellowship								
— Full-Time	873,990	(29)	942,600	(30)	292,570	(10)	2,109,160	(69)
— Part-Time	—		8,500	(1)	—		8,500	(1)
Independent Research Allowance								
— Studentship	17,876	(8)	12,302	(6)	—		30,178	(14)
— Fellowship	8,834	(2)	11,617	(3)	5,350	(2)	25,801	(7)
Clinical Fellowship	229,255	(5)	291,428	(7)	192,492	(5)	713,175	(17)
Clinical Investigatorship/† Establishment Grant	582,131	(3)	284,461	(2)	—		866,592	(5)
Clinical Traineeship	—		—		—		—	
Scholarship/Establishment‡	1,091,222	(7)	1,912,296	(6)	305,500	(1)‡	3,309,018	(14)
Heritage Medical Scientist/† Establishment Grant	970,230	(1)	—		—		970,230	(1)
Independent Establishment Grant	710,035	(2)	380,932	(3)	—		1,090,967	(5)
Major Equipment Grant	563,158	(23)	853,559	(15)	—		1,416,717	(38)
Conference Grant	177,931	(11)	169,500	(16)	3,446	(1)	350,877	(28)
Technology Transfer Grant								
— Phase I	25,000	(1)	50,000	(2)	—		75,000	(3)
— Phase II	75,000	(1)	100,000	(2)	25,000	(1)	200,000	(4)
Visiting Scientist								
— To Alberta	9,200	(1)	33,485	(3)	—		42,685	(4)
— From Alberta	—		—		—		—	
Visiting Professor	5,200	(5)	—		—		5,200	(5)
Totals	**$6,109,139**	**(221)**	**$5,734,369**	**(192)**	**$ 835,575**	**(23)**	**$12,679,083**	**(436)**

Notes: * Values shown are committed amounts on the effective date of award.

† Values shown are committed amount for approved Establishment Grants only.

‡ Includes $2,500 per Full Time Studentship and Part Time Fellowship awards, $5,000 per Full Time Fellowship awards and $7,500 per Clinical Fellowship awards.

‡ Cross Cancer Institute Awards.

TABLE 2: Summary of Applications Received and Processed During the 1986-87 Award Year

Number of Applications Processed

Award Category	U of A Total	A	R	O	U of C Total	A	R	O	Others Total	A	R	O	Totals Total	A	R	O
Studentship																
– Full Time	74	17	18	39	98	15	19	64	1	0	0	1	173	32	37	104
– Part Time	3	1	0	2	0	0	0	0	1	0	1	0	4	1	1	2
– Summer	154	100	53	1	118	63	54	1	8	3	5	0	280	166	112	2
Fellowship																
– Full Time	90	18	17	55	63	17	18	28	32	4	9	19	185	39	44	102
– Part Time	1	0	0	1	3	1	1	1	0	0	0	0	4	1	1	2
Independent Research Allowance																
– Studentship	5	0	3	2	4	2	1	1	0	0	0	0	9	2	4	3
– Fellowship	2	0	0	2	4	2	0	2	2	1	0	1	8	3	0	5
Clinical Fellowship	3	1	1	1	17	3	4	10	8	3	0	5	28	7	5	16
Clinical Investigatorship/ Establishment Grant	4	2	1	1	6	2	1	3	0	0	0	0	10	4	2	4
Scholarship/Establishment	24	2	10	12	20	5	3	12	1	0	0	1	45	7	13	25
Heritage Medical Scientist/ Establishment Grant	3	1	0	2	3	1	2	0	0	0	0	0	6	2	2	2
Independent Establishment Grant	11	3	3	5	4	2	2	0	1	0	0	1	16	5	5	6
Major Equipment Grant	45	26	17	2	31	16	15	0	2	2	0	0	78	44	32	2
Conference Grant	16	12	4	0	16	0	0	0	0	0	0	0	32	12	4	0
Technology Transfer Grant Phase I	5	1	4	0	5	3	2	0	3	0	3	0	13	4	9	0
Technology Transfer Grant Phase II	2	2	0	0	1	1	0	0	5	1	3	1	8	4	3	1
Visiting Scientist																
– To Alberta	7	3	4	0	6	2	3	1	0	0	0	0	13	5	7	1
– From Alberta	2	0	2	0	3	2	1	0	0	0	0	0	5	2	3	0
Visiting Professor	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Totals	**452**	**190**	**137**	**125**	**402**	**137**	**126**	**123**	**64**	**14**	**21**	**29**	**918**	**341**	**284**	**277**

A = Approved R = Rejected O = Withdrawn/Pending

TABLE 3: Grants and Awards Renewed/Continued — 1986-87

Award Category	U of A Total	U of C Total	Others Total	Totals
Studentship				
— Full-Time	91	77	3	171
— Part-Time	3	1	—	4
Fellowship				
— Full-Time	71	51	23	145
— Part-Time	1	1	—	2
IndependentResearchAllowance				
— Studentship	10	7	1	18
— Fellowship	—	3	4	7
Clinical Fellowship	3	7	9	19
Clinical Investigator/ Establishment Grant	4	2	—	6
Scholarship/Establishment Grant	29	53	—	82
Heritage Medical Scientist/ Establishment Grant	2	8	1	11
Totals	**214**	**210**	**41**	**465**

TABLE 4: Total Awards Active on March 31, 1987

Award Category	U of A Total	U of C Total	Others Total	Totals
Clinical Investigator/ Establishment Grant	7	4	0	11
Heritage Medical Scientist/ Establishment Grant	3	8	1	12
Heritage Scholarship/ Establishment Grant	32	57	1	90
Totals	**42**	**69**	**2**	**113**

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

FINANCIAL STATEMENTS
March 31, 1987

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To the Trustees of the Alberta Heritage Foundation for Medical Research

I have examined the balance sheet of the Alberta Heritage Foundation for Medical Research as at March 31, 1987 and the statements of revenue and expenditure and revenue surplus for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Foundation as at March 31, 1987 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Donald D. Salmon

C.A.
Auditor General

Edmonton, Alberta
August 11, 1987

BALANCE SHEET
as at March 31, 1987

	1987	1986
ASSETS		
Cash	$3,108,083	$5,511,095
Accounts receivable (Note 4)	229,548	177,442
Mortgages receivable from research scientists	619,200	670,653
Fixed assets	232,470	271,757
	$4,189,301	**$6,630,947**
LIABILITIES AND SURPLUS		
Accounts payable	$4,022,986	$1,707,742
Revenue surplus	166,315	4,923,205
	$4,189,301	**$6,630,947**

The accompanying notes are part of these financial statements.

STATEMENT OF REVENUE AND EXPENDITURE
for the year ended March 31, 1987

	1987	1986
REVENUE		
Transfers from the Alberta Heritage Foundation for Medical Research Endowment Fund	$53,000,000	$45,000,000
Interest	756,826	580,725
	53,756,826	**45,580,725**
EXPENDITURE		
Scientific programs:		
Building program grants	21,726,500	5,496,000
Scholarship and establishment grants	9,368,187	9,873,094
Fellowship grants and research allowances	6,448,950	6,781,100
Studentship grants and research allowances	3,830,499	4,056,986
Research support costs	2,581,670	2,572,272
Major equipment and maintenance grants	2,498,884	3,462,611
Heritage medical scientist grants	2,447,231	3,735,616
Institutional grants	2,126,546	3,394,433
Clinical fellowship grants	1,437,739	1,231,857
Clinical investigatorship grants	1,290,973	677,360
Independent establishment grants	1,053,357	1,147,464
Technology transfer grants	584,800	55,000
Special initiative grants	444,253	186,071
Visiting lecturer grants to universities	316,067	368,883
Conference support grants	292,455	248,121
Travel grants to universities	216,188	198,752
Independent research allowances	125,515	111,876
Visiting scientist grants	101,352	183,748
Recruitment and planning grants to universities	21,942	25,888
Clinical trainee grants	10,564	40,957
Visiting professor honoraria and travel grants	6,716	23,170
Research professor-in-residence	—	7,444
	56,930,388	43,878,703
Administration expenses, Schedule 1	1,111,101	1,023,578
Scientific Advisory Council expenses	114,001	156,674
Trustee expenses	127,757	142,947
Other committee expenses	230,469	106,526
	58,513,716	**45,308,428**
Excess (deficiency) of revenue over expenditure for the year	**$(4,756,890)**	**$ 272,297**

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

STATEMENT OF REVENUE SURPLUS
for the year ended March 31, 1987

	1987	1986
Revenue surplus at beginning of year	$ 4,923,205	$4,650,908
Excess (deficiency) of revenue over expenditure for the year	(4,756,890)	272,297
Revenue surplus at end of year	**$ 166,315**	**$4,923,205**

NOTES TO THE FINANCIAL STATEMENTS
March 31, 1987

NOTE 1
Authority

The Alberta Heritage Foundation for Medical Research operates under the authority of the Alberta Heritage Foundation for Medical Research Act, Chapter A-26, Revised Statutes of Alberta 1980, as amended.

NOTE 2
Significant Accounting Policies and Reporting Practices

Fixed Assets:
Fixed assets are stated at cost less accumulated depreciation and amortization.

Changes in Financial Position:
A statement of changes in financial position is not provided as disclosure in these financial statements is considered to be adequate.

NOTE 3
Alberta Heritage Foundation for Medical Research Endowment Fund

The Endowment Fund operates pursuant to the Alberta Heritage Foundation for Medical Research Act and consists of an initial endowment of $300,000,000 from the Alberta Heritage Savings Trust Fund together with cumulative earnings thereon, less cumulative transfers to the Foundation.

Transfers to the Foundation are available upon request provided the payment of such transfers would not result in the net assets of the Endowment Fund, as valued on a cost basis, being less than the initial endowment.

The net assets of the Endowment Fund at March 31, 1987, as valued on a cost basis, amounted to approximately $449,000,000 and on a market value basis, to approximately $529,000,000.

NOTE 4

Accounts Receivable	**1987**	**1986**
Unexpended grants held by universities:		
Travel	$130,736	$101,224
Visiting lecturer	81,146	34,914
Miscellaneous	—	17,000
	211,882	153,138
Other	17,666	24,304
	$229,548	**$177,442**

NOTE 5
Commitments

As at March 31, 1987 the Foundation had committed $54,216,418 (1986 $74,336,620) for scientific programs:

Building program grants	$26,605,874
Scholarship and establishment grants	14,121,319
Fellowship grants and research allowances	3,214,046
Heritage medical scientist grants	2,913,952
Studentship grants and research allowances	1,813,014
Institutional grants	1,445,437
Clinical investigatorship grants	1,303,750
Independent establishment grants	956,138
Major equipment and maintenance grants	606,747
Clinical fellowship grants	549,954
Special initiative grants	496,077
Conference support grants	128,000
Other grants and allowances	62,110
	$54,216,418

These commitments pertain to the following fiscal years:

1987-88	$34,863,528
1988-89	13,416,168
1989-90	3,377,884
1990-91	2,047,282
1991-92	482,011
1992-93	29,545
	$54,216,418

NOTE 6
Approval of Financial Statements

These financial statements were reviewed by the Audit Committee and recommended to the Trustees for their approval.

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

SCHEDULE OF ADMINISTRATION EXPENSES

Schedule 1

for the year ended March 31, 1987

	1987	1986
Salaries	$ 541,936	$ 520,145
Rental of premises	101,675	21,743
Public relations and advertising	100,307	62,936
Stationery, printing and office supplies	84,495	90,663
Employee benefits	69,295	60,280
Depreciation and amortization	62,321	63,550
Travel and accommodation	27,532	52,950
Maintenance	22,647	17,257
Postage and courier	20,939	21,417
Telephone	18,830	18,887
Vehicle	14,645	15,414
Consultant fees	14,611	58,841
Insurance	14,419	8,306
Legal fees	8,353	5,041
Staff training	3,627	3,389
Miscellaneous	5,469	2,759
	$1,111,101	**$1,023,578**

Programs of the Foundation

Heritage Medical Scientist Awards

This award is designed to encourage the recruitment and establishment of senior medical scientists to Alberta. A Heritage Medical Scientist is a leader in his field and is internationally recognized for his scientific contributions.

Alberta investigators with a record of outstanding research, whose stipend from competitive funding agencies (MRC, NSERC, AHFMR, etc.) is scheduled to terminate are also eligible.

Scholarships

Alberta Heritage Medical Research Scholarships support investigators recently trained in medical research who have demonstrated promise and ability to initiate and conduct independent research. A five-year, renewable Scholarship allows scientists to develop medical research unhampered by heavy teaching and service duties.

Scholarships are granted by competition and based upon the excellence of the candidate, the originality and importance of the project, and the quality of the proposed research environment.

Clinical Investigatorships

Clinical Investigatorships give clinically qualified medical scientists holding full-time academic appointments further research training and experience assisted by competitively-funded basic or clinical researchers. Clinical investigators must have an M.D. or D.D.S., have completed clinical specialty training and two or three years of supervised medical research. The three-year award may be extended for three years but is not renewable.

Independent Establishment Grants for New Investigators

Heritage Medical Research Independent Establishment Grants are given to new investigators who are not funded by the Foundation (who may or may not hold an award from another research granting agency). This grant is designed to help new investigators quickly achieve maximal research productivity by providing equipment, technical assistance, materials and supplies.

Fellowships

Heritage Medical Research Fellowships provide qualified candidates with full-time post-graduate training in research in an area of medical science relevant to the aims of the Foundation. Fellows must have an M.D., D.D.S., D.V.M., Ph.D., or equivalent degree and must demonstrate high academic standing and evidence of research ability.

Clinical Fellowships

Clinical Fellowships give individuals who have completed clinical training an opportunity to gain supervised medical research experience. The applicant must have a medical or dental degree obtained within the last ten years and have completed subspecialty clinical training. The one-year award may be renewed three times.

Studentships

The Foundation provides three types of awards: Full-time, Part-time, and Summer Studentships.

There are a limited number of Full-time Studentships for students registered in full-time M.Sc. or Ph.D. programs, and who plan careers in medical research. The University must accept students into a graduate program and invite students to apply for an AHFMR Studentship. Studentships are granted by competition based on excellence.

A limited number of Part-time Studentship awards are available to full-time students working towards professional health-related degrees. Research required by the curriculum is not eligible for support.

Summer Studentship awards support promising Alberta university students who wish to spend their summer months (May to August) engaged in medical research.

Research Allowances

(Independently Funded Students & Fellows)

Holders of full-time Studentships and Fellowships awarded by another research agency using similar guidelines and standards are eligible to apply to the Foundation for a Research Allowance.

Technology Transfer Grants

The Technology Transfer Program is designed to provide a unique opportunity for Alberta medical researchers or engineers to promote university/industrial collaboration in Alberta, stimulate technological innovation in Alberta, and advance medical research to the stage where private investors may provide seed capital.

Phase I grants enable applicants to strengthen the technical merit and explore the feasibility of a scientifically sound project.

Phase II grants apply when a product or technique has been identified and laboratory tested but requires further investigation and refinement to attract seed/venture capital.

Visiting Scientists
Awards for Visiting Scientists to Alberta enable a limited number of highly innovative and productive medical scientists to engage in medical research in an Alberta university for the purpose of bringing special knowledge and expertise to the host, department, group, or institution.

Awards for Visiting Scientists from Alberta enable Alberta medical scientists to undertake collaborative research which they are unable to undertake locally due to inadequate technology or collegial expertise. Research funded must be an obvious step in the progression of a sustained research effort on the part of the Visiting Scientist.

Conference Grants
The Foundation supports a limited number of conferences and workshops clearly related to the enhancement of medical research in Alberta and the transmission of significant new knowledge to those responsible for the management of patients.

Conference support is usually limited to the funding of a small number of distinguished medical scientists invited to participate as special lecturers or major participants. Funds also support a limited number of workshops on collaborative research and workshops which explore and evaluate new research findings.

Visiting Lecturers
The Visiting Lecturer program helps Alberta universities attract outstanding medical scientists who can broaden and enrich the educational experience of graduate students and fellows. The program also gives Alberta investigators, individually or in groups, the opportunity to discuss their research with other experts in their field of medical research.

Travel Grants
The Foundation annually gives Travel Grants to The University of Alberta and The University of Calgary to be administered by the universities for the following purposes:
— Attendance of faculty members at workshops, conferences, and annual meetings.
— Recruitment of researchers.
— Short visits to discuss complicated experimental design and cooperative research.
— Short visits to other laboratories to study new research techniques and to host external investigators who can assist in establishing new techniques.

Visiting Professors
Heritage Medical Research Visiting Professorships are available for the purpose of recognizing and attracting truly outstanding medical scientists to visit Alberta to enrich and enhance the climate of medical research within the universities and the affiliated institutions.

Grants for Major Equipment
Major Equipment Grants permit the university on behalf of investigators to purchase equipment essential to high-quality research. Applications usually relate directly to research projects supported by competitive granting agencies.

Grants for Equipment Maintenance ensure adequate maintenance of major equipment wholly funded by the Foundation's Major Equipment Grants. Preference is given to expensive facilities providing support to groups of researchers and multidisciplinary projects, especially those facilities offering services to researchers with partial or full recovery arrangement for regular operating costs.

APPLICATIONS ADVISORY COMMITTEE MEMBERS

DR. W. L. ALBRITTON, Professor and Dept. Head, Faculty of Medicine (Microbiology), Univ. of Sask.
DR. M. BALA, Professor & Head, Dept. of Medicine, University Hospital, Saskatoon, Sask.
DR. M. BISBY, Professor, Faculty of Medicine (Medical Physiology), U of C
DR. W. A. BRIDGER, Professor, Faculty of Medicine (Biochemistry), U of A
DR. L. BRYAN, Professor & Dept. Head, Faculty of Medicine (Microbiology & Infectious Diseases), U of C
DR. P. CODDING, Associate Professor, Faculty of Science (Chemistry), U of C
DR. J. EGGERMONT, Professor, Faculty of Social Sciences (Psychology), U of C
DR. F. M. EGGERT, Associate Professor, Faculty of Dentistry (Stomatology), U of A
DR. C. B. FRANK, Assistant Professor, Faculty of Medicine (Surgery), U of C
DR. H. FRIESEN, Dept. Head, Faculty of Medicine (Physiology), U of Manitoba
DR. G. GALL, Professor, Faculty of Medicine (Pediatrics & Medicine), U of C
DR. T. GORDON, Associate Professor, Faculty of Medicine (Pharmacology), U of A

DR. H. J. GOREN, Professor, Faculty of Medicine (Medical Biochemistry), U of C
DR. D. GREEN, Assistant Professor, Faculty of Medicine (Immunology), U of A
DR. D. A. HANLEY, Associate Professor, Faculty of Medicine (Internal Medicine), U of C
DR. D. HART, Professor, Faculty of Medicine (Microbiology & Infectious Diseases and Medicine), U of C
DR. R. HODGETTS, Professor, Faculty of Science (Genetics), U of A
DR. J. A. HOFFER, Associate Professor, Faculty of Medicine (Medical Physiology & Clinical Neurosciences), U of C
DR. G. HOLLAND, Associate Professor, Faculty of Dentistry (Restorative Dentistry), U of A
DR. K. IATROU, Associate Professor, Faculty of Medicine (Medical Biochemistry), U of C
DR. S. JENSEN, Associate Professor, Faculty of Medicine (Microbiology), U of A
DR. E. KNAUS, Professor, Faculty of Pharmacy, U of A
DR. R. LEE, Professor & Dept. Head, Faculty of Medicine (Clinical Neurosciences & Medicine), U of C
DR. Y. LEFEBVRE, Associate Professor, Faculty of Medicine (Medical Biochemistry), U of C
DR. C. LORD, Associate Professor, Faculty of Medicine (Pediatrics), U of A and Glenrose Hospital
DR. S. F. P. MAN, Professor, Faculty of Medicine (Medicine), U of A
DR. E. E. McCOY, Professor, Faculty of Medicine (Pediatrics), U of A
DR. W. PARANCHYCH, Professor, Faculty of Medicine (Biochemistry), U of A
DR. M. PATERSON, Professor, Faculty of Medicine (Biochemistry), U of A and Cross Cancer Institute
DR. K. PEARSON, Professor, Faculty of Medicine (Physiology), U of A
DR. Q. PITTMAN, Associate Professor, Faculty of Medicine (Medical Physiology), U of C
DR. H. R. RABIN, Professor, Faculty of Medicine (Medicine & Microbiology and Infectious Diseases), U of C
DR. R. REITHMEIER, Associate Professor, Faculty of Medicine (Biochemistry), U of A
DR. J. REMMERS, Professor, Faculty of Medicine (Medicine), U of C
DR. D. A. K. RONCARI, Julia McFarlane Professor of Diabetes Research, Faculty of Medicine, U of C
DR. S. H. ROTH, Professor, Faculty of Medicine (Pharmacology & Therapeutics and Anaesthesia), U of C
DR. A. SALMI, Professor, Faculty of Medicine (Medical Microbiology & Infectious Diseases), U of A
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DR. W. SCHNEIDER, Associate Professor, Faculty of Medicine (Biochemistry), U of A
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DR. M. SMITH, Professor, Faculty of Medicine (Biochemistry), UBC
DR. R. STEIN, Professor, Faculty of Medicine (Physiology), U of A
DR. J. TYBERG, Professor, Faculty of Medicine (Medicine & Medical Physiology), U of C
DR. D. L. TYRRELL, Chairman & Professor, Faculty of Medicine (Medical Microbiology & Infectious Diseases and Medicine), U of A
DR. W. VEALE, Professor & Dept. Head, Faculty of Medicine (Medical Physiology), U of C
DR. M. WALSH, Associate Professor, Faculty of Medicine (Medical Biochemistry), U of C
DR. J. WEINER, Professor, Faculty of Science (Biochemistry), U of A
DR. W. WENMAN, Associate Professor, Faculty of Medicine (Pediatrics), U of A
DR. F. WITKOWSKI, Associate Professor, Faculty of Medicine (Cardiology), U of A
DR. D. WOODS, Associate Professor, Faculty of Medicine (Microbiology & Infectious Diseases), U of C
DR. G. WYSE, Professor, Faculty of Medicine (Medicine & Pharmacology and Therapeutics), U of C

Personnel

Heritage Medical Scientists

ALLEN, Peter, Ph.D., Department of Applied Sciences in Medicine, Faculty of Medicine, University of Alberta "Imaging and Biochemical Applications of NMR to Medicine"

DAVISON, Joseph, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Nervous Control of Gastrointestinal Secretions"

MALONEY, John, Ph.D., Departments of Obstetrics and Gynecology and Medical Physiology, Faculty of Medicine, University of Calgary "The Physiology and Development of the Fetus and Neonate"

McGHEE, James, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Gene Expression During Animal Development"

PATERSON, Malcolm, Ph.D., Departments of Medicine and Biochemistry, Faculty of Medicine, University of Alberta "Clinical Genetics and Molecular Carcinogenesis"

REMMERS, John, M.D., Departments of Medicine and Medical Physiology, Faculty of Medicine, University of Calgary "Control of Breathing by the Nervous System"

SALMI, Aimo, M.D., Ph.D., Department of Medical Microbiology and Infectious Diseases, Faculty of Medicine, University of Alberta "Immunopathogenesis of Neurovirological Diseases"

TER KEURS, Henk, M.D., Ph.D., Departments of Medicine and Medical Physiology, Faculty of Medicine, University of Calgary "Activation and Contraction of the Heart"

TYBERG, John, M.D., Ph.D., Departments of Medicine and Medical Physiology, Faculty of Medicine, University of Calgary "Cardiac Mechanics: Factors Affecting the Heart's Pumping Action"

VANCE, Dennis, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Phospholipid and Lipoprotein Metabolism"

WANG, Jerry, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Studies in Cell Regulation"

YOON, Ji-Wong, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Two Possible Mechanisms for the Pathogenesis of Virus-Induced Diabetes Mellitus"

Heritage Medical Scholars

ANDERSON, M. John, Ph.D., Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "Development of the Neuromuscular Junction"

ANDERSON, Robert, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Control of Virus Synthesis and Assembly"

AUER, Roland, Ph.D., M.D., Department of Pathology, Faculty of Medicine, University of Calgary "Neuronal Death in Ischemia, Hypoglycemia, and Epilepsy"

BAZETT-JONES, David, Ph.D., Departments of Anatomy and Medical Biochemistry, Faculty of Medicine, University of Calgary "Ultrastructure of Transcription Complexes"

BEFUS, Dean, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Studies of Intestinal Immunity and Mast Cells"

* BIDDLE, Fred, Ph.D., Departments of Pediatrics and Medical Biochemistry, Faculty of Medicine, University of Calgary "Genetic Studies of Threshold Traits of Mammalian Development"

BLASDEL, Gary, Ph.D., Department of Physiology, Faculty of Medicine, University of Calgary "Development of Thalamocortical Afferents"

BLEACKLEY, Robert, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Molecular Genetics of T Cell Differentiation"

BOISVERT, Donald, Ph.D., M.D., Department of Surgery, Faculty of Medicine, University of Alberta "Pathophysiology and Therapy of Cerebrovascular Occlusion"

BOURNE, Gregory, Ph.D., Department of Physiology, Faculty of Medicine, University of Alberta "The Regulation of Testicular GnRH Receptors and GnRH-like Peptides and Their Roles in Steroidogenesis"

BOWLING, Douglas, Ph.D., Departments of Medical Physiology and Anatomy, Faculty of Medicine, University of Calgary "Projections of Single Identified Retinal Axons"

BULLOCH, Andrew, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Cellular Basis of Adult Neuronal Plasticity"

* CARNE, Thomas, Ph.D., Department of Chemistry, Faculty of Science, University of Calgary "Biosynthesis of Pituitary Hormones"

CLANDININ, Michael, Ph.D., Departments of Foods and Nutrition and Gastroenterology, Faculties of Home Economics and Medicine, University of Alberta "Nutrition and Metabolism of Dietary Fat"

CODDING, Penelope, Ph.D., Departments of Chemistry and Pharmacology and Therapeutics, Faculties of Science and Medicine, University of Calgary "Molecular Structure and Function Studies of CNS Active Drugs and Toxins"

* DANIELSON, Terry, Ph.D., Department of Pharmacy and Pharmaceutical Sciences, Faculty of Pharmacy, University of Alberta "Metabolism and Plasma Levels of Clinical Monoamine Oxidase Inhibitors"

DASGUPTA, Mrinal, M.D., Department of Nephrology, Faculty of Medicine, University of Alberta "MBP-Specific CIC in Multiple Sclerosis"

DAY, Rufus III, Ph.D., Department of Medicine, Cross Cancer Institute "DNA Repair and Gene Regulation in Human Tumor Systems"

DELAY, Michael, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Excitation-Contraction Coupling in Muscle"

DUFF, Henry, M.D., Department of Medicine, Faculty of Medicine, University of Calgary "Mechanistic Approach to Antiarrhythmic Therapy"

EGGERMONT, Jos, D.Sc., Department of Psychology, Faculty of Social Sciences, University of Calgary "Functional Plasticity of the Auditory Nervous System"

FAMIGLIETTI, Edward, M.D., Ph.D., Department of Anatomy, Faculty of Medicine, University of Calgary "Functional Architecture of Vertebrate Retina"

FIELD, Leigh, Ph.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "The Genetics of Susceptibility to Insulin-Dependent Diabetes"

FINEGOOD, Diane, Ph.D., Department of Medicine, Faculty of Medicine, University of Alberta "Hepatic Insulin Action and Insulin Resistance"

* FORD, Gordon, M.D., Department of Internal Medicine, Faculty of Medicine, University of Calgary "Interdependence of the Lung, Ribcage and Diaphragm During Atelectasis"

FOTEDAR, Arun, Ph.D., Department of Immunology, Faculty of Medicine, University of Alberta "T Cell Recognition"

FRANK, Cyril, M.D., Department of Surgery, Faculty of Medicine, University of Calgary "Connective Tissue Structure and Function"

FRENCH, Robert, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Ionic Channels in Excitable Membranes"

FRITZLER, Marvin, Ph.D., M.D., Division of Rheumatology and Clinical Immunology, Faculty of Medicine, University of Calgary "Antinuclear Antibodies in Autoimmune Diseases"

FUJITA, Donald, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Control of Oncogene Activity"

GILES, Wayne, Ph.D., Departments of Medicine and Medical Physiology, Faculty of Medicine, University of Calgary "Electrophysiology of Isolated Cardiac Cells"

GORDON, Tessa, Ph.D., Department of Pharmacology, Faculty of Medicine, University of Alberta "Neuromuscular Plasticity"

GREEN, Douglas, Ph.D., Department of Immunology, Faculty of Medicine, University of Alberta "Immunoregulatory T Cells and Molecules"

GREEN, Francis, M.D., Ph.D., Department of Pathology, Faculty of Medicine, University of Calgary "Mechanisms of Lung Injury by Environmental Agents"

GREENSHAW, Andrew, Ph.D., Department of Psychiatry, Faculty of Medicine, University of Alberta, "Beta-Phenylethylamine, p-Tyramine and p-Octopamine and the Treatment of Affective Disorders"

* HANGARTNER, Thomas, Ph.D., Department of Applied Sciences in Medicine, Faculty of Medicine, University of Alberta "Development of Methods to Diagnose and Treat Bone Disorders"

* HANLEY, David A., M.D., Department of Internal Medicine, Faculty of Medicine, University of Calgary "Studies of Parathyroid Hormone Physiology"

HART, David, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Immunochemical Characterization of Plasminogen Activators"

HICKS, T. Philip, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Identification of Synaptic Transmitters in the Mammalian Visual and Somatosensory Systems"

* HINDSGAUL, Ole, Ph.D., Department of Chemistry, Faculty of Science, University of Alberta "Biological Recognition of Complex Carbohydrates"

* HOAR, David, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "DNA Sequence Diversity in Man"

HOFFER, J. Andy, Ph.D., Departments of Medical Physiology and Clinical Neurosciences, Faculty of Medicine, University of Calgary "Neural Control of Movements"

HULBERT, William, Ph.D., Department of Medicine, Faculty of Medicine, University of Alberta "The Effect of H_2S on Airway Structure and Function"

IATROU, Kostas, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "The Organization, Expression and Evolution of Eukaryotic Multigene Families in Chorion of Bombyx Mori"

* JARVIS, Simon, Ph.D., Department of Physiology, Faculty of Medicine, University of Alberta "Molecular Properties and Regulation of the Nucleoside Transport System"

JAWORSKI, Martine, M.D., Department of Pediatrics, Faculty of Medicine, University of Alberta "Pathogenesis of Insulin Dependent Diabetes Mellitus"

JENSEN, Susan, Ph.D., Department of Medical Microbiology and Infectious Disease, Faculty of Science, University of Alberta "Biosynthesis of Novel Penicillin and Cephalosporin Antibiotics"

JUGDUTT, Bodh, M.D., Department of Cardiology, Faculty of Medicine, University of Alberta "Modification of Ventricular Shape and Function During Healing After Myocardial Infarction"

KAUFMAN, Susan, Ph.D., Department of Endocrinology, Faculty of Medicine, University of Alberta "Control Mechanisms of Fluid and Electrolyte Balance"

KING, Malcolm, Ph.D., Department of Medicine, Faculty of Medicine, University of Alberta "Studies on Mucus Clearance"

KOOPMANS, Henry, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "The Internal Control of Food Intake"

LAFRENIERE, Rene, M.D., Department of Surgery, Faculty of Medicine, University of Calgary "Adoptive Immunotherapy of Tumors with Activated Lymphocytes and Biological Response Modifiers"

LAU, David, M.D., Ph.D., Department of Medicine, Faculty of Medicine, University of Calgary "Regulation of Adipose Tissue Development and Growth"

LEE, Patrick, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "The Mechanism of Virus Attachment of Host Cells"

* LEFEBVRE, Yvonne, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Passage of Steroid and Thyroid Hormones Across the Nuclear Envelope of Mammalian Cells"

LEUNG, Wai-Choi, Ph.D., Departments of Medicine and Medical Microbiology Infectious Diseases, Faculty of Medicine, University of Alberta "Molecular Cloning of Viral Neutralization Antigen and Human Tumor Antigen"

LORD, Catherine, Ph.D., Department of Pediatrics, Faculty of Medicine, University of Alberta "Sex Differences in Autism"

MacVICAR, Brian, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Neuronal Basis for Synchrony During Seizure"

* MANNONI, Patrice, M.D., Department of Pathology, Faculty of Medicine, University of Alberta "Antigen Characteristics of Hematopoietic Stem Cells"

MANTLE, Michèle, Ph.D., Departments of Medical Biochemistry and Pediatrics, Faculty of Medicine, University of Calgary "Structure, Synthesis and Secretion of Intestinal Mucus"

MARANDA, Bruno, Ph.D., Department of Surgery, Faculty of Medicine, University of Alberta "Immuno-Cytochemical Investigation of Axonal Transport"

MARTIN, Renée, Ph.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "Cytogenetic Analysis of Human Sperm"

MATHESON, David, M.D., Departments of Pediatrics and Internal Medicine, Faculty of Medicine, University of Calgary "Cellular Regulation of Immune Responses"

McFADDEN, Grant, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Molecular Biology of Tumorogenic Shope Fibroma Poxviruses"

McGARRY, Ronald, Ph.D., Departments of Pediatrics, Faculty of Medicine, University of Calgary "Functional Role of MAG"

McPHERSON, David, M.D., Department of Internal Medicine, Faculty of Medicine, University of Calgary "Cardiac Evaluation with Ultrasound"

* MILLER, Rodman, Ph.D., Department of Anatomy, Faculty of Medicine, University of Calgary "Freeze Fracture Localization of Antigens and of Cholesterol"

MILOS, Nadine, Ph.D., Department of Anatomy and Cell Biology, Faculty of Medicine, University of Alberta "Factors Controlling Pattern Formation by Neural Crest Cells"

MINUK, Gerald, M.D., Department of Medicine, Faculty of Medicine, University of Calgary "Role of GABA in Liver Disease"

MOORE, Graham, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "The Synthesis and Evaluation of Peptide Hormones and Analogues"

MORTIMER, David, Ph.D., Departments of Obstetrics and Gynecology and Physiology, Faculty of Medicine, University of Calgary "Human Sperm Physiology and Infertility"

* NORTHUP, John, Ph.D., Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "GTP Binding Proteins and Adenylate Cyclase"

PALCIC, Monica, Ph.D., Department of Food Science, Faculty of Agriculture/Forestry, University of Alberta "Enzyme Inhibitors as Therapeutic Agents"

PARHAD, Irma, M.D., Department of Pathology, Faculty of Medicine, University of Calgary "Neurofibrillary Degeneration: Pathogenic Mechanisms"

PARSONS, Howard, M.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "Energy Expenditure and Fatty Acid Metabolism"

PITTMAN, Quentin, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Peptide Neurotransmission in Brain"

PREIKSAITIS, Jutta, M.D., Department of Medical Microbiology and Infectious Diseases, Faculty of Medicine, University of Alberta "Transfusion Acquired Cytomegalovirus Infection: Epidemiology and Immune Response in Man"

PROCHAZKA, Arthur, Ph.D., Department of Physiology, Faculty of Medicine, University of Alberta "Neural Control of Mammalian Movement"

QUANDT, Fred, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Electrical Properties of Isolated Retinal Neurons"

RAMCHARAN, Savitri, M.D., Ph.D., Department of Community Health Sciences, Faculty of Medicine, University of Calgary "Epidemiologic Studies of the Menstrual Cycle and PMS"

RATTNER, Jerome, Ph.D., Departments of Medical Biochemistry and Anatomy, Faculty of Medicine, University of Calgary "High Order Structure of Chromosomes"

REH, Thomas, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Regeneration of Optic Nerve"

REHA-KRANTZ, Linda, Ph.D., Department of Genetics, Faculty of Science, University of Alberta "The Biochemical Basis of Mutation"

* REITHMEIER, Reinhart, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Structure and Function of Membrane Proteins"

REYNOLDS, John, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Studies of the Intestinal Immune System"

RORSTAD, Otto, M.D., Ph.D., Department of Medicine, Faculty of Medicine, University of Calgary "Mechanisms of Action of Brain Peptides"

SCHNEIDER, Wolfgang, Ph.D., Department of Biochemistry, Faculty of Medicine, University of Alberta "Receptor-Mediated Endocytosis in Oocytes"

SCHNETKAMP, Paul, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Visual Transduction in Rod Photoreceptors"

SCHÜRCH, Samuel, Ph.D., Department of Medical Physiology, Faculty of Medicine, University of Calgary "Lung Stability and Cell Adhesion"

SEVERSON, David, Ph.D., Department of Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "Lipid Metabolism in Heart and Blood Vessels"

SINGH, Bhagirath, Ph.D., Department of Immunology, Faculty of Medicine, University of Alberta "Mechanism and Regulation of Antigen Recognition by T-Lymphocytes"

SMITH, Peter, Ph.D., Department of Pharmacology, Faculty of Medicine, University of Alberta "Electrophysiological Studies of the Electrogenic Sodium Pump in Sympathetic Ganglia and Spinal Cord"

SNYDER, Floyd, Ph.D., Departments of Medical Biochemistry and Pediatrics, Faculty of Medicine, University of Calgary "Studies of Inherited Disorders of Nucleotide Metabolism"

SOKOL, Pamela, Ph.D., Department of Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Role of Iron in the Pathology of Pseudomonas Infection"

STOCKBRIDGE, Norman, M.D., Ph.D., Department of Surgery, Faculty of Medicine, University of Alberta "Signal Processing by Neurons"

TAYLOR, Diane, Ph.D., Department of Medical Microbiology and Infectious Diseases, Faculty of Medicine, University of Alberta "Characterization of Bacterial Plasmids"

TRAYHURN, Paul, Ph.D., Departments of Gastroenterology and Foods and Nutrition, Faculty of Medicine, University of Alberta "Regulation of Energy Balance"

* TYLER, Jonathan, Ph.D., Department of Genetics, Faculty of Science, University of Alberta "Structure and Function of Biological Membranes"

VOGEL, Hans, Ph.D., Department of Chemistry, Faculties of Medicine and Science, University of Calgary "NMR Studies of Mechanistic and Regulatory Aspects of Metabolism"

WAISMAN, David, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Studies of Calcium Binding Proteins"

WALSH, Michael, Ph.D., Department of Medical Biochemistry, Faculty of Medicine, University of Calgary "Enzyme Regulation by Calcium"

WENMAN, Wanda, M.D., Department of Pediatrics, Faculty of Medicine, University of Alberta "Human Infections with Chlamydia Trachomatis"

WITKOWSKI, Francis, M.D., Department of Cardiology, Faculty of Medicine, University of Alberta "Autonomic Neural Influences in Arrhythmogenesis"

WONG, Sui-Lam, Ph.D., Department of Biological Sciences, Faculty of Science, University of Calgary "Gene Regulation and Secretion in Bacillus Subtilis"

WOODS, Donald, Ph.D., Department of Microbiology & Infectious Diseases, Faculty of Medicine, University of Calgary "Pathogenesis of Pseudomonas Aeruginosa Disease"

WYSE, George, Ph.D., M.D., Departments of Medicine and Pharmacology and Therapeutics, Faculty of Medicine, University of Calgary "Investigations in Hypertension and Electrophysiology"

Heritage Clinical Investigators

BEAUCHENE, James, M.D., Department of Surgery, Faculty of Medicine, University of Alberta "Biological Basis of Therapeutic Tissue Expansion"

COE, James, M.B.B.S., Department of Pediatrics, Faculty of Medicine, University of Alberta "Pharmacological Manipulation of the Neonatal Circulation"

FEDORAK, Richard, M.D., Department of Gastroenterology, Faculty of Medicine, University of Alberta "Adaptation and Regulation of Intestinal Glucose Transport"

FLETCHER, William, M.D., Department of Clinical Neurosciences, Faculty of Medicine, University of Calgary "Visual Motor Dysfunction with Frontal Lobe Lesions"

GILL, Michael, M.D., Department of Medical Microbiology and Infectious Diseases, Faculty of Medicine, University of Calgary "Investigations of Viral Pathogenesis"

GILLIS, Anne, M.D., Department of Medicine, Faculty of Medicine, University of Calgary "Myocardial Kinetics and Pharmacodynamics"

MACLEAN, Grant, M.D., Department of Medicine, Faculty of Medicine, University of Alberta "Monoclonal Antibodies in Small Cell Lung Cancer"

RYAN, Edmond, M.D., Department of Endocrinology, Faculty of Medicine, University of Alberta "Insulin Resistance in Pregnancy"

SCOTT, Brent, M.D., Department of Pediatrics, Faculty of Medicine, University of Calgary "Gastrointestinal Motor Function"

VAN AERDE, Johny, M.D., Department of Pediatrics, Faculty of Medicine, University of Alberta "Fat Utilization in Parenterally Fed Newborn Infants, Measured with Indirect Caloricity and with Tracer Kinetics of 13"

WARNOCK, Garth, M.D., Department of Surgery, Faculty of Medicine, University of Alberta "Transplantation of Human Islets of Langerhans"

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